SECTION 02225
EXCAVATION, BACKFILL AND COMPACTION

02225.1.00 Work Included

A. The Contractor shall provide all labor, materials, tools, equipment and all else required for and to perform the excavation, backfill and compaction for the streets, concrete curb and gutter, concrete sidewalks and other items detailed in these Specifications, shown on the Drawings and required by the Engineer under them.

B. Excavation, either Undercut or Unclassified as described hereinafter, shall include the removal of soil, gravel and rock not included in Section 02229: Rock Excavation, brick, block, stumps, root mat, broken concrete curb or pavement, foundations, rubbish, or other debris objectionable to the Engineer for sub-base of pavements, structures, embankments, or other facilities.

C. Excavation shall also include stockpiling of materials which in the opinion of the Engineer are suitable for backfill and embankment material. The cost of removal, transportation, and disposal of spoil material shall be included by the Contractor in the excavation Work.

D. The Contractor shall engage the services of a qualified soils laboratory to conduct continuous soils testing during grading operations. The soils laboratory and its work on this project shall be approved by the Engineer.

E. The Contractor shall incorporate all Unclassified Excavation material which in the opinion of the Engineer is suitable for reuse in roadway fill, embankments, trenches, etc., prior to using any Select Fill material.

F. Select Fill shall include location of suitable material, uncovering, grading, loading, transportation to site, placement in proper lifts, and compaction to densities specified in this Section.

G. The Contractor shall immediately notify the Engineer and cease related excavation activities upon the discovery of abandoned graves, wells, fuel tanks and hazardous or non-hazardous waste disposal sites.

H. Excavation, backfill, and compaction for roadways, walkways, driveways, structures, recreational facilities, landscaping, etc. shall be to the horizontal alignment and elevations shown on the Drawings, detailed in these Specifications and required by the Engineer to meet the requirements of the Work.

I. Care shall be exercised by the Contractor to prevent excessive excavation or undercutting not directed by the Engineer. In the event such excessive excavation or undercutting takes place, the areas will be backfilled and compacted with material and to the compaction densities specified in this Section by the Contractor at no additional cost to the City.

02225.1.01 Definition of Terms

A. Unclassified Excavation shall refer to the removal of all materials regardless of nature or composition between the existing earth surface and the proposed subgrade elevations for the proposed Work, except for Site Clearing as provided in Section 02224; Trench Excavation, Backfill, and Compaction as provided in Section 02226; and Rock Excavation as provided in Section 02229.

B. Undercut Excavation shall refer to the removal of undesirable material and replacement with suitable native borrow or select backfill material below finished subgrade or below existing grade in areas where embankment is proposed, except for Site Clearing as provided in Section 02224; Trench Excavation, Backfill, and Compaction as provided in Section 02226; and Rock Excavation as provided in Section 02229. The need and extent of Undercut Excavation shall be determined by the Engineer.

C. Select Fill shall mean an approved borrow material transported to the site, placed on the approved base in appropriate lifts, graded and compacted in accordance with this Section. The need and extent of Select Fill shall be determined by the Engineer.

02225.1.02 Delivery, Storage, and Handling

A. Contractor shall only use approved truck routes for hauling of equipment, select material for bedding or backfill, excess or spoil dirt for disposal, etc. Approval for hauling shall be obtained from appropriate governing agency (NCDOT, CRM, private property owner, etc.) prior to start of work.

B. Where necessary for the Contractor to remove and/or purchase Select Fill material from a borrow site, said site shall comply with requirements for a permitted quarry operation as set forth by the Land Resources Division of the Dept. of Environment, Health, and Natural Resources.

C. Soil stockpiles shall be protected to prevent erosion in accordance with Chapter 17 of the City Code, Soil Sedimentation and Erosion Control Ordinance for the City Rocky Mount.

D. No stockpiling of backfill, spoil, aggregate, or other construction material or debris shall be permitted on a City street open to vehicular traffic without an approved plan for signing, barricading, and detouring as necessary.

02225.1.03 Dewatering

A. The Contractor shall at all times provide and maintain ample means and equipment with which to continuously remove and properly dispose of surface and ground water entering the excavation. Where conditions are such that running or standing water occurs in the excavation or the soil in the excavation bottom displays a "quick" tendency, the water shall be removed by pumps using suitable dewatering means such as well points, pervious underdrain bedding or temporary ditches. Such dewatering activities shall be continuously maintained by the Contractor until the construction operations are completed and then removed in such manner as to not disturb the work.

B. Where, in the opinion of the Engineer, the occurrence of running or standing water or wetness in the excavation or subgrade is due to a permanent condition such as a spring, perched water table, subsurface drainage, or proximity to a natural watercourse, the Engineer may require the installation of subsurface drainage. Subsurface drainage shall be installed when directed by the Engineer.

02225.1.04 Safety Regulations

A. The Contractor shall require all construction to adhere to the rules, regulations, and interpretations of the North Carolina Department of Labor relating to occupational safety and health standards for the construction industry including, but not specifically limited to Title 29, Code of Federal Regulations, Section 1926 , Subpart P regarding "Excavations, Trenching, and Shoring" as recorded in the Federal Registry.

02225.1.05 Quality Control

A. Weather and Temperature Limitations

1. Excavation, backfill, and compaction for establishment of subgrade elevation shall not be performed during rainy weather or using wet or frozen material.

2. Any areas of completed subgrade that are damaged by elements such as rain, sleet, snow, hail, or freeze/thaw conditions shall be reconditioned, reshaped, and compacted in accordance with the Drawings and these Specifications.

02225.1.06 Soils Laboratory

A. In order for the Contractor to produce a street with a minimum service life specified in City Policy, subsurface exploration must be made along the location of the proposed street in order for sufficient data to be available to define soil conditions which could reasonably be expected to be encountered and develop the soils support value on which the pavement design can be based. The extent and depth of low load bearing soils and soils which contain organic material must therefore be determined.

B. Sampling, transport, storage and handling of soil samples to be tested for this project shall be in accordance with NCDOT procedures and standards. Laboratory testing and analysis of soils shall be in accordance with ASTM Standards and NCDOT Standards where applicable.

C. The Laboratory making the exploration, testing and analysis of soils for this project shall be accredited and approved by the NCDOT and the City of Rocky Mount. The Laboratory shall have the capability of conducting soils testing and analysis in accordance with ASTM Standards.

D. Sub-Grade Soil Tests

1. The Laboratory conducting the subsurface soils exploration of the proposed street as well as the testing and analysis of the subgrade soils shall be under the responsible charge of a Geotechnical Engineer who shall be qualified in soils technology, experienced in this class of work and be a Registered Professional Engineer. All Soils Reports shall be prepared under the Geotechnical Engineers' direct supervision and shall be transmitted under a cover letter from the Geotechnical Engineer, include a map showing each boring location, boring log, soil classification, density curve and bearing capacity of the sub-base using the California Bearing Ratio (CBR) method.

2. The subsurface soils report shall be prepared and submitted based on the detail drawings of the project which show each street profile, plan, details and design information. This report shall detail a testing and analysis of subgrade soil samples taken with a 2-1/2" spoon to a depth of 6' below proposed final grade at 200' intervals along the proposed street centerline. The subgrade soil samples shall be taken after the street right of way has been cleared, grubbed and brought to rough grade of the final street profile. In areas where the soil type changes between boring locations, additional borings shall be taken at 50' intervals in order to determine the subgrade soil transition locations. The soils

laboratory shall test the in-place sub-grade in order to verify that the California Boring Ration (CBR) and Soil Support Value (SSV) for the entire sub-base conforms to original sub-base design prior to placement of any base CABC for the structural pavement. The subgrade soil core samples shall be retained in an undisturbed condition by the Geotechnical Engineer in his office for a minimum of 30 calendar days for the purpose of inspection by the City Engineer.

3. If the Engineer determines that the sub-base must be undercut and select fill used to bring the excavation up to the grade of the roadway base, the select fill must be placed in layers sufficient for the overall in-place sub-base to be compacted to 100% dry density. The soils laboratory shall then test the in-place select fill in order to determine the California Boring Ration (CBR) and Soil Support Value (SSV) for the entire sub-base meets or exceeds the original sub-base design prior to placement of any base CABC for the structural pavement.

02225.1.07 Alignment and Smoothness Test

1. Locations for alignment and smoothness testing of the sub-base shall be at random locations specified by the Engineer. Contractor shall be responsible for supplying two competent workers to assist Engineer or his appointed representative in testing.

2. The top surface of the "in place" and compacted subgrade shall not show any deviations in excess of one tenth (0.10") inch when checked for departure from cross-sections shown on the Plans when checked with either a stringline and rule or grade rod and level.

3. Any deviation in excess of the above amount shall be corrected by the Contractor by loosening, adding or removing material, reshaping, and compacting when directed by the Engineer at no additional cost to the City.

02225.1.08 Compaction Densities

1. Backfill shall be compacted at plus or minus two (2%) percent of optimum moisture content and shall yield the following minimum compaction densities when tested in accordance with AASHTO T99-90, or latest edition:

   a. Areas within five (5) feet of roadways, other pavements, and structures shall have a minimum soil density of ninety-

eight (98%) percent from initial subgrade or undercut excavation.

b. Areas within 12" outside the back to back of curb when the subgrade is undercut and backfilled with select fill shall have a minimum compaction of one-hundred percent (100%) dry weight density.

c. All other areas shall have a minimum soil density of ninety (90%) percent from initial subgrade or undercut excavation.

2. Compaction test shall be taken at random locations set by the Engineer to check for compliance with the above required densities. Optimum moisture and density tests shall be performed by the AASHTO T99 method using a 5.5 pound rammer and 12" drop. Insitu moisture content and density compaction tests shall be by the sand-cone in accordance with AASHTO T 191 or shall be conducted by nuclear methods in accordance with AASHTO T 238 and T 239 for density and moisture content, respectively.

3. A minimum of two sample sites shall be performed per job site. At least two sample sites shall be tested for each block of proposed street or structure less than 1000 square feet in surface area. Additional test sites may be required for larger structures or for changing soil conditions. Contractor shall provide smooth, level surfaces at locations and depths as designated by the Engineer for testing. Cost for testing shall be covered

4. Tests shall be performed by a licensed Geotechnical Testing Firm approved by the Engineer.

02225.1.09 Proofrolling

1. All roadway subgrade shall be tested for bearing capacity by proofrolling with a fully loaded dual or triple rear axle dump truck. Truck shall be sufficiently loaded with ballast to provide a minimum gross weight of thirty (30) tons.

2. Subgrade shall be tested for conformance with alignment and grade in accordance with 02225.1.08.1.a. or b., as the case may be, above, prior to proofrolling.

3. Truck shall make sufficent passes over roadway subgrade to test entire surface of subgrade. Truck shall be operated at a speed of

between two hundred and twenty-five (225) and three hundred (300) feet per minute.

4. Proofrolling shall only be performed in the presence of the Engineer.

5. Proofrolling must be performed within ten (10) days of placement of stone or pavement. If precipitation occurs after proofrolling but prior to placement of stone or asphalt, then the surface shall be proofrolled again.

02225.2 PRODUCTS

02225.2.01 Fill Material

A. All backfill materials shall be approved prior to use by the Engineer or his representative.

B. All backfill materials shall be consistent with typical cross-sections as shown on Drawings and detailed in the Bid Schedule.

C. The use of Select Fill material shall be authorized by the Engineer only after depletion of suitable on-site borrow material.

D. Acceptable select native (on-site) and/or borrow material shall be provided free of the following: organic matter, construction material, lumps or rocks larger than six (6") inches in their greatest diameter with no more than 15% of the lumps or rocks greater than two (2") inches in their greatest diameter, frozen or excessively wet material, debris, or other objectionable materials which would hinder placement, compaction, and consolidation of the backfill material.

E. Select Fill material shall meet the following soil and gravel classifications as covered in ASTM D2321 and restated below:

1. Class I - Angular, one quarter to one and one half (1/4” to 1-1/2") inch graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, and crushed shells. Examples: #57 and #67 crushed, washed stone in accordance with NCDOT SSRS Table 1005-1.

2. Class II - Coarse sands and gravels with maximum particle size of one and one half (1-1/2") inch, including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil Types GW, GP,

SW, and SP (Unified Soil Classification System) are included in this class.

3. Class III - Fine sand and clayey gravels, including fine sands, sand-clay mixtures, and gravel-clay mixtures. Soil Types GM, GC, SM, and SC (Unified Soil Classification System) are included in this class.

02225.2.02 Soil Stabilization Woven Fabric

A. Where soil stabilization woven fabric is specified herein, called out on the drawings or directed by the Engineer, the Contractor shall furnish and install a woven textile product specially designed and manufactured to stabilize the sub-base of streets and roadways. The product shall meet or exceed AASHTO M288 Specification for serviceability level class 2, and shall be Style 250ST Geotex woven geotextiles manufactured by SI Geeosolutions or equal approved by the Engineer.

02225.3 EXECUTION

02225.3.01 Unclassified Excavation

A. All suitable material removed in the excavation shall be used as far as practicable in the formation of embankments, subgrades, and shoulders, and at such other places as may be indicated on the Drawings or directed by the Engineer.

B. The Engineer will designate materials that are unsuitable.

C. The Contractor shall furnish disposal areas for the unsuitable and/or excess material except where the Engineer permits the use of such material in the widening or flattening of fill slopes.

02225.3.02 Undercut Excavation

A. When the Engineer determines that the native soil materials in areas where fills are to be placed are undesirable in their location or condition, the Engineer may require the Contractor to remove the undesirable material and backfill with approved material properly compacted.

B. When the Engineer determines that the finished graded cross-section contains materials which are undesirable in their location or condition, the Engineer may require the Contractor to remove the undesirable material and backfill with approved material properly compacted to the finished graded section.

C. Contractor shall conduct undercut operations such that excavation and hauling operations cause the least disturbance and destruction to the unstable and surrounding subgrade materials.

D. In some instances, the Engineer may require excavation and hauling of waste material to proceed in one direction and back-dumping, spreading, and compacting of replacement material to be performed in the opposite direction.

02225.3.03 Rock Excavation

A. All rock shall be removed and replaced with cushioning material to a depth of six (6") inches below the subgrade in accordance with Section 02229 and directed by the Engineer.

02225.3.04 Embankment

A. Where existing grades require the use of embankment or fill to reach the required section elevation, the Contractor shall deposit suitable spoil material from excavated areas. Such spoil material shall be free from debris, roots, trees, stones, or other unsuitable substances, and shall be placed in successive layers of loose material not more than 8-inches in depth. Each layer shall be spread uniformly by the use of a road machine or other approved device and rolled with an approved tamping or three-wheeled power roller until thoroughly compacted to a minimum of the required density as specified in paragraph 02226.1.06 C., above.

B. Embankments or fills shall be maintained at all times during their construction so as to prevent an accumulation of standing water in the event of rain.

02225.3.05 Roadside Ditch Excavation

A. For roadside ditch grading, a slope of three-horizontal to one-vertical (3:1) shall be required on both the front and back slopes. The three to one slope shall extend to the property line and then at a two-horizontal to one-vertical (2:1) slope until it intersects the natural property grade. The Engineer may waive the two to one in lieu of a flatter slope as the situation dictates.

B. Where possible, the longitudinal slope of roadside ditches shall match the slope of the adjacent roadway.

02225.3.06 Subgrade Testing and Approval

A. Conformance to Cross-Sections

1. After all excavation, undercutting and backfilling have been completed, the subgrade shall be properly shaped and compacted to conform with the lines and grades shown on the approved Drawings or directed by the Engineer.

2. Subgrade shall be checked for conformance with tolerances set forth in 02226.1.06 B., above.

3. All areas exceeding the allowable tolerances shall be excavated and brought to a firm, unyielding condition before any base course, surface course, or pavement is placed thereon.

B. Proofrolling

1. All roadway subgrades shall be tested for bearing capacity by proofrolling with a fully loaded dual or triple rear axle dump truck. Truck shall be sufficiently loaded with ballast to provide a minimum gross weight of thirty (30) tons.

2. Subgrade shall be tested for conformance with alignment and grade in accordance with 02226.1.06 B., above, prior to proofrolling.

3. Truck shall make sufficent passes over roadway subgrade to test entire surface of subgrade. Truck shall be operated at a speed of between two hundred and twenty-five (225) and three hundred (300) feet per minute.

4. Proofrolling shall only be performed in the presence of the Engineer.

5. Proofrolling must be performed within ten (10) days of placement of stone or pavement. If precipitation occurs after proofrolling but prior to placement of stone or asphalt, then the surface will need to be proofrolled again.

C. Compaction Density: All soft and yielding material, boulders, loose stones, or any other unsuitable materials in the subgrade which will not readily compact shall be removed and replaced with suitable material which shall then be thoroughly compacted. All roots, stumps, and other perishable matter encountered in the preparation of the subgrade shall be removed to a depth of not less than two feet below the surface of the pavement, unless otherwise directed by the Engineer. Any portion of the

subgrade inaccessible to the roller or rolling equipment shall be thoroughly compacted with hand or mechanical tampers.

02225.3.07 Backfill Adjacent To Curb and Gutter And Pavements

A. No earth backfill or pavement shall be placed adjacent to concrete curb, curb and gutter, header curb and concrete gutter, sidewalks, driveways, or other paved areas the area adjacent to the newly poured concrete until at least three (3) curing days have elapsed. However, earth backfill may be placed within four (4) days of the expiration of the curing period. The quantity and type of backfill shall be approved by the Engineers. Such backfill shall be backfilled, smoothed off, and maintained so as to prevent the accumulation of standing water in the event of rain.

02225.3.08 Salvage of Usable Materials

A. All reusable materials including undamaged granite curb, paving blocks, brick, castings, pipe, etc., removed during excavation shall be delivered to the City Street Division lot in the vicinity of Albermarle Avenue and Virginia Street. Care shall be taken that granite curb, when encountered, shall not be broken into short lengths, but shall be delivered in the same lengths as found. Loss or unnecessary damage to any such items shall be considered the Contractor's responsibility, and the City shall take credit for such loss or damage when deemed advisable by the Engineer. It should be noted that roadside ditch pipe belongs to the abutting property owners.

02225.3.09 Finishing of Slopes and Surfaces

A. The surface of all areas of earth and other materials shall be finished to a reasonably smooth and compact surface substantially in accordance with the surface lines, cross sections and elevations indicated on the Drawings or established by the Engineer.

B. Immediately upon establishment of finished grades, all backfilled or otherwise disturbed areas which are not to receive structures or pavement shall be fine graded and seeded in accordance with Section 02936.

02225.3.10 Protection of Trees

A. Only where it is found to be absolutely necessary shall trees be removed. Those trees to be removed shall be designated by the Engineer. The Contractor shall take all possible precautions to insure that all other trees are not damaged. Trees that are skinned shall be trimmed and bare spots coated with asphaltum based tree paint.

END OF SECTION 02225